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Field Service Procedure

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Narkomed 6000 Series
Triple Vapor Mount Conversion

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Narkomed 6000 Series
Triple Vapor Mount Conversion

INSTALLATION

The Triple Vapor Mount conversion procedure applies to Narkomed 6000 or Narkomed 6400 machines fitted with Double Vapor Mount. If the unit serial number is 11270 or lower, the cockpit weldment chassis must also be replaced to accommodate this upgrade. All systems prior to serial #11271 will require upgrade kit #4118083. All systems with serial number #11271 and higher will require upgrade kit #4118082.

WARNING: The 3rd Vapor upper and lower mount assemblies shall not be disassembled beyond the level prescribed in this procedure. Further disassembly may result in a failure of the interlock mechanism or fresh gas leak.

WARNING: Proper calibration of the triple vaporizer assembly's interlock mechanism and back rests are required after the initial installation, replacement of either the upper or lower sub-assembly, or the initial installation of vaporizers.

NOTE: The following is a list of additional components that are required to perform this installation and are not provided in either of the above referenced kits.

Part Number	Description
4115127	Molykote
4118301	A-050 E-clip insertion tool
4118294	Loctite #425 Assure - Plastic Compatible (Blue)
7910445	Loctite #222 (Purple)

1. Turn the System Power switch to STANDBY.
2. Remove AC power from the machine.
3. Wait at least 3.5 minutes, then after the green LED on the Vitalbus HUB has turned off, pull all circuit breakers to their 'out' position.

   WARNING: Before servicing, ensure that AC power is removed from the machine and all circuit breakers are disengaged (pulled out). Failure to observe this precaution may cause injury by electric shock.

4. If the machine is fitted with a boom arm, remove it and retain its mounting hardware.
5. If the machine is fitted with a left side GCX rail, remove and discard it.

   NOTE: If desired, a shortened left side GCX rail can be obtained and is available separately under order number 4118247.

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6. Remove all vaporizers from the Vapor Mount assembly and store in an upright position for future use.

   WARNING: Do not tilt Vapor 19.n vaporizers more then 45 degrees or higher than expected output concentrations may result.

7. Remove the upper back panel.
8. On the left (facing the front of the machine) side of the cockpit area, remove the upper POD blind plate or, if fitted with an Integrated Patient Monitoring Module, remove the related patient data cables then disconnect its Vitalbus cable. Loosen the captive mounting screw on the IPMM pod and remove it from the machine.
9. Disconnect the patient sample line at the gas analyzer water trap. Unscrew two thumbscrews and disconnect the Vitalbus cable from the cable connection at the back of the gas analyzer. Remove the exhaust line from the hose barb at the back of the gas analyzer. Loosen captive mounting screw on the gas analyzer and remove it from the machine.
10. If machine serial number is 11271 or higher, skip to step 15.
11. If an auxiliary power strip is attached to the cockpit weldment, slide the assembly up and off of its mounting brackets. Remove and retain the mounting bracket and hardware.
12. Remove and retain the monitor top cover (1) and the seven screws and washers securing it to the frame chassis. Refer to FIGURE 1.

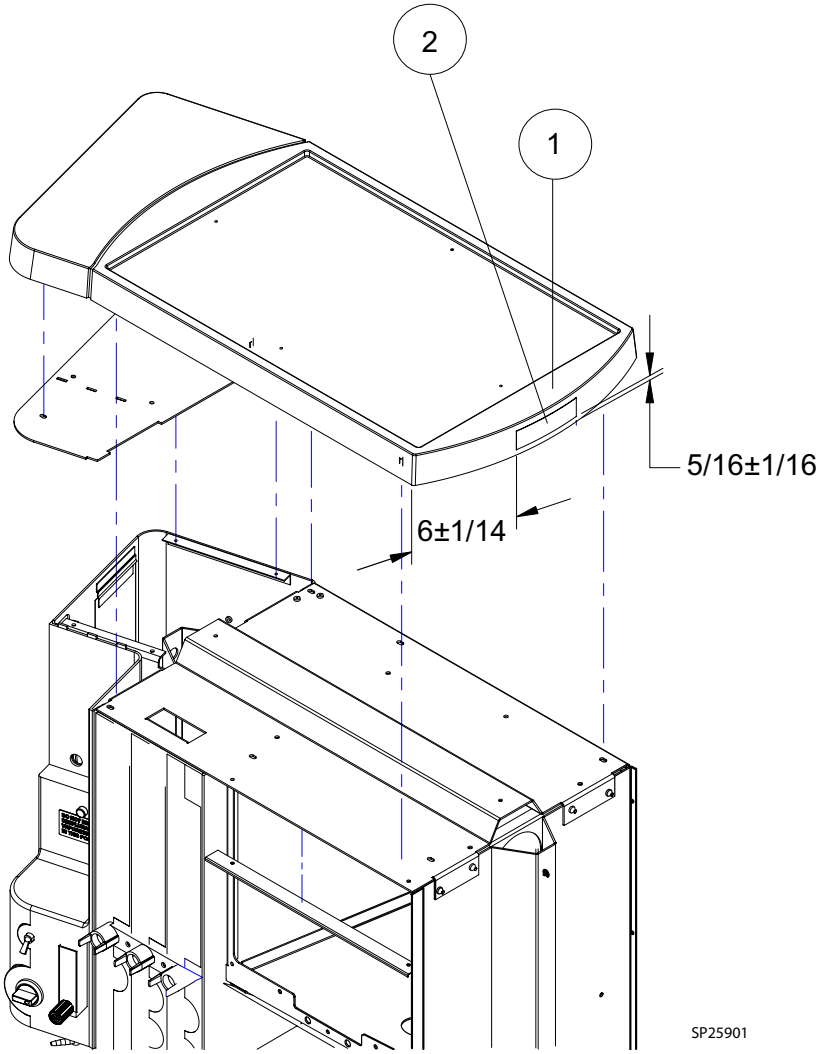

FIGURE 1. Monitor Top Cover

13. Remove and retain the plate above the cockpit and its mounting hardware.
14. Remove and retain the plate under the cockpit and its mounting hardware.
15. Disconnect the two copper tubes at the back of the double vapor mount assembly (7). Refer to FIGURE 2.
16. Disconnect the copper tube (3) from the upper union fitting connector (4), and discard this tube.

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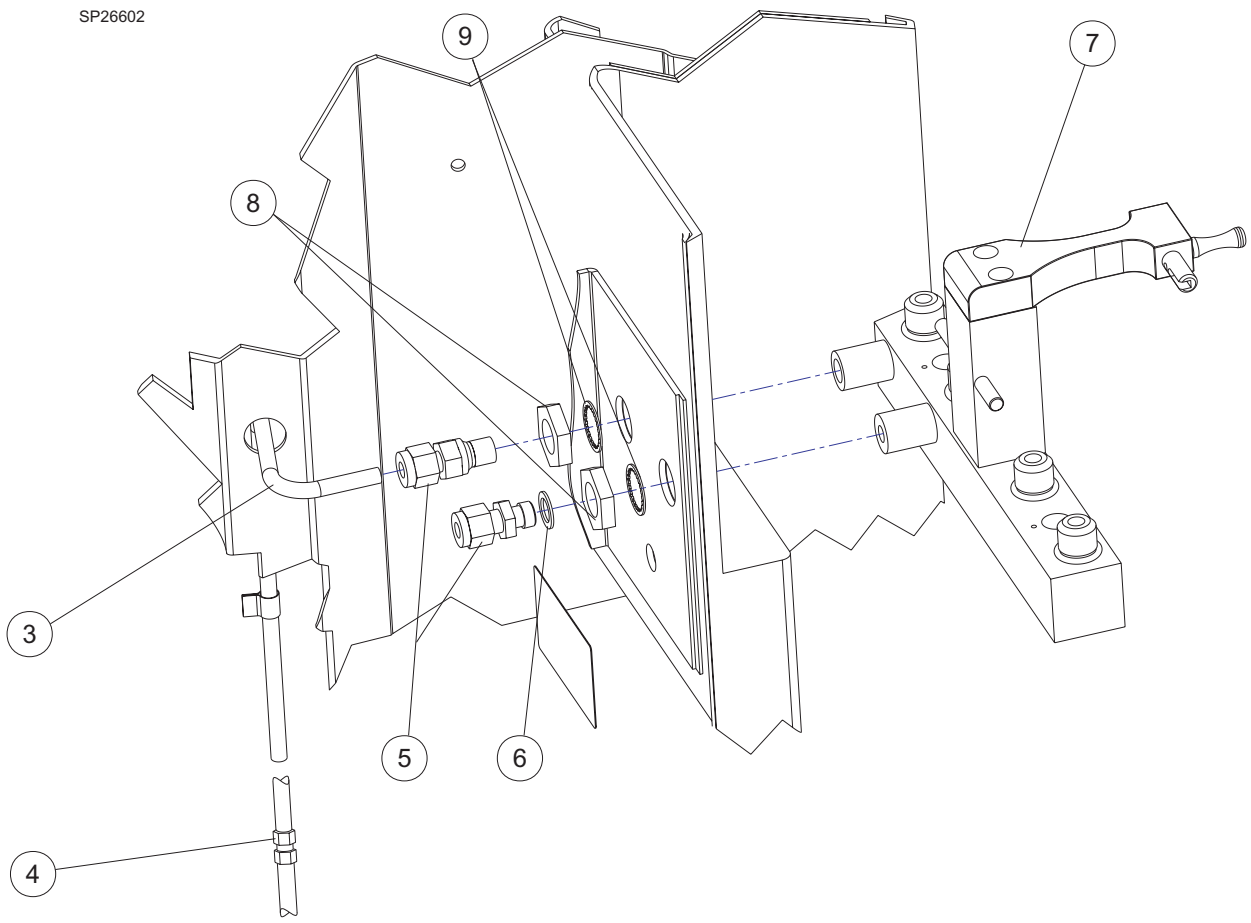

FIGURE 2. Existing Double Vapor Mount Assembly

17. Remove the two brass fittings (5) and copper washer (6) from the double vapor mount assembly (7) and discard these components.

18. While supporting the vaporizer and exclusion assembly at the front, remove the large jam nuts (8) and lockwashers (9) and slide the assembly forward to remove it from the machine then discard this assembly and its mounting hardware.
19. If machine serial number is 11271 or higher skip to step 39.
20. Turn the System Power switch to ON.
21. Remove the electrical switch bracket mounted to the cockpit cover and retain its mounting hardware.
22. Disconnect the two copper tubes from the System Power switch.
23. While supporting the Suction switch, remove its retaining nut and remove it from the cockpit cover and also remove the inside lockwasher. Retain the valve and its mounting hardware for future use.
24. While holding the cockpit cover, remove and retain the hardware at the bottom corner of the assembly and lay the cockpit cover onto the Divan lid.
25. While supporting the cockpit weldment, remove and retain the hardware securing the front of the assembly.
26. Remove and retain the hardware securing the rear of the assembly and remove the cockpit weldment.

    NOTE: If the upper front hex nut can not be removed, refer to the instruction provided in the Fresh Gas Flow Sensor replacement procedure located in Section 4.5.8 of the Narkomed 6000 Series Service manual.

27. If the machine was fitted with sheet metal strips to shim the vaporizer back rest, they should be removed and discarded.
28. Apply Loctite # 222 (purple) to the front 2/3 threads of the 10-32 x 1-1/2 set screw and from inside of the new cockpit weldment. Install it into the vapor rest bracket until approximately 1/8” protrudes out the front of the bracket.
29. Orient the cockpit weldment with its rear flange wrapped into the flowmeter housing and, while supporting the assembly, secure it to the frame chassis by reusing the hardware previously removed.

    NOTE: If any of the electronic Fresh Gas Flow components were previously removed, reinstall them per the Fresh Gas Flow Sensor replacement procedure given in Section 4.5.8 of the Narkomed 6000 Series Service manual.

30. Orient the Suction switch with the Vacuum Valve port at the 12:00 o’clock position, ensuring its tubing is not kinked or twisted. Slip the lockwasher onto the valve and insert it into the cockpit cover and secure the retaining nut.
31. Reattach and secure the two copper tubes to the System Power switch.
32. Insert the cockpit cover tab into the groove of the flowmeter housing. Align cockpit cover’s height to the height of cockpit weldment and secure the cover to the weldment by reusing the hardware previously removed.
33. Attach the electrical switch bracket to the cockpit cover by reusing the hardware previously removed. Align the bracket parallel to the cover then tighten the hardware. Exercise the System Power switch and listen for an audible ‘clicking’ sound that verifies that the electrical switch actuates properly.

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CAUTION: Verify that all tubes and wires are properly dressed and away from moving parts. Reroute as necessary.

34. Turn the System Power switch to Standby.
35. Reinstall the plate under the cockpit and secure it with the hardware previously removed.
36. Reinstall the plate above the cockpit and secure it with the hardware previously removed.
37. If an auxiliary power strip was previously attached to the cockpit weldment, reinstall its retaining brackets by reusing the hardware previously removed. Install the assembly by sliding the assembly down onto its mounting bracket.
38. Reinstall and secure the monitor top cover to the frame chassis by reusing the hardware previously removed. Refer to mounting locations in FIGURE 1.
39. Remove the large jam nuts and lock washers supplied with the Lower Triple Vapor Mount assembly (10) then move its knob (31) to the raised position and lubricate the inner slot surfaces of the link (51) with Molykote (P/N 4115127). See FIGURE 3.

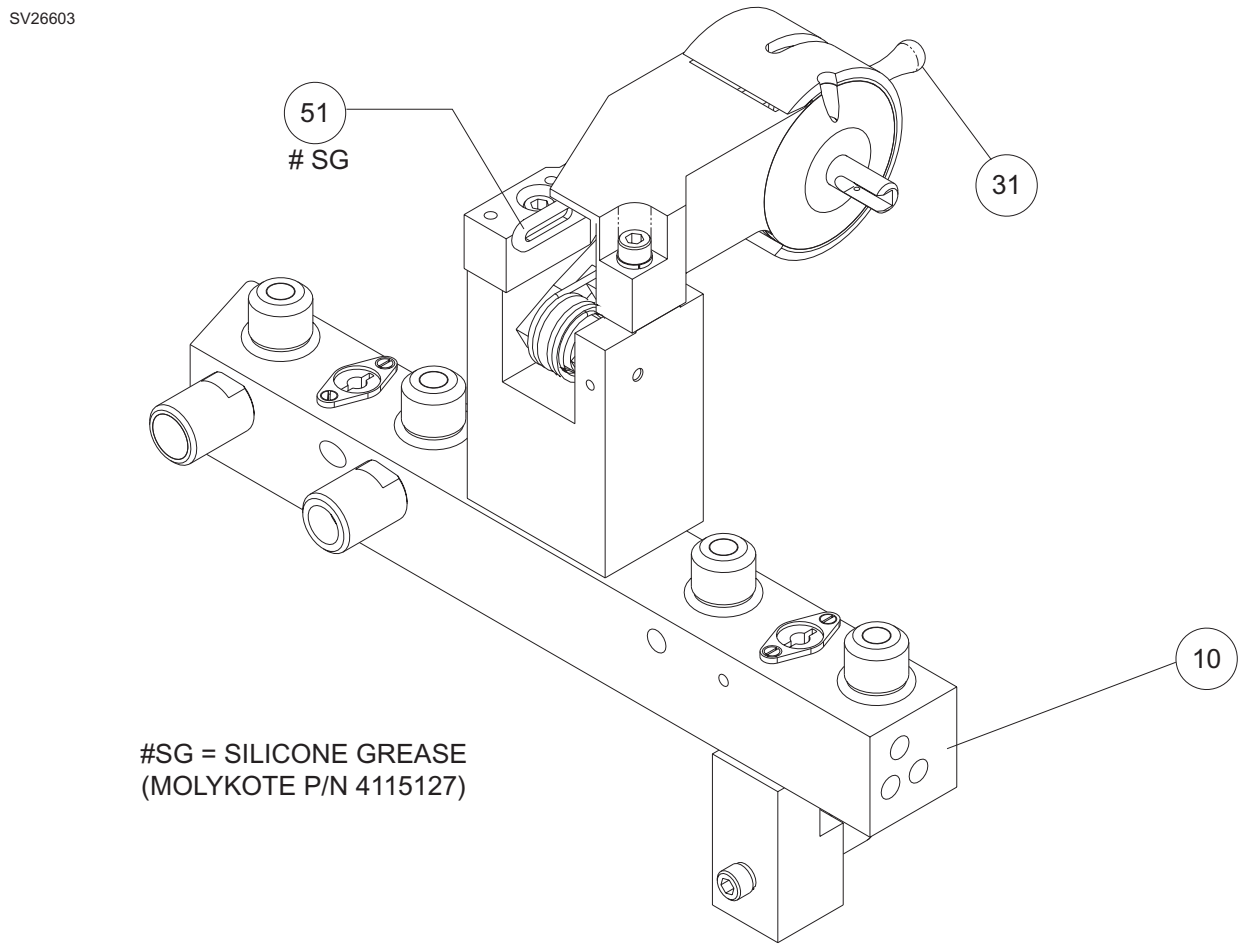

FIGURE 3. Inner Slot Lubrication

40. Install the Lower Triple Vapor Mount assembly (10) to the chassis by reinstalling the previously removed lock washers (9) and jam nuts (8) (Ref: these items are supplied with item 10). See FIGURE 2. and FIGURE 4.

    NOTE: Ensure the assembly is level and flush with the cockpit panel prior to tightening hardware.

41. Remove and retain the nut and ferrules from brass fitting (11), then apply a minimal amount of Loctite #222 (purple) to its pipe threads. Install it into the Lower Triple Vapor Mount assembly port at the inboard location. See FIGURE 5.
42. Remove and save the nut and ferrules from the brass fitting (12), then slip a new copper washer (13) onto it. Install it into the outboard port of the Lower Triple Vaporizer Mount assembly (10). See FIGURE 4. and FIGURE 5.
43. Reconnect and secure the existing copper tube (52) to the brass fitting at the outboard port on the Lower Triple Vapor Mount assembly (10). See FIGURE 5.
44. Loosely assemble Brace Bracket (14) to Upper Triple Vapor Mount assembly using hardware (15, 16). See FIGURE 4. and FIGURE 6.
45. While supporting the Upper Triple Mount assembly, insert the link of the Lower Triple Vapor Mount into the slot in the lever (53) of the Upper Triple Vapor Mount assembly, and then insert the pivot pin (17) through the hole in the lever and the slot in the link from right to left. See FIGURE 7. Carefully and slowly walk the tab on the Upper Triple Mount assembly into the corresponding chassis slot and secure the assembly with two 1/4 - 20 x 2 socket cap screws (18), 1/4” lock washers (19), and 1/4” flat washers (20). See FIGURE 4.

    CAUTION: Do not twist the Upper Triple Vapor Mount or bend the slider lever on the Lower Triple Vapor Mount assembly or damage to the exclusion system may occur.

46. Slide a slotted screw driver between the cockpit weldment and the head of the pivot pin (17) then using an A-050 E-clip insertion tool (P/N 4118301), install the E-clip (21) onto the lower pivot pin. See FIGURE 4.
47. Remove the nuts and ferrules from the Upper and Lower Triple Vapor Mounts.
48. Locate copper tube (22). If nut and ferrules were not previously installed, insert the tube into either end of brass union fitting (23). While applying pressure on the brass union fitting, tighten with a wrench. Remove the fitting and inspect to ensure the tube is protruding at least 1/8” beyond the front ferrule. Repeat this process on the opposite end of the copper tube. If not previously installed, apply a ‘Mix’ label (24) to each end of this tube. See FIGURE 4.
49. Insert the shorter end of tube (22) into the access hole in the cockpit and rotate the tube to gain proper alignment for its insertion. Attach the tube’s long end to the brass fitting at the inboard port of the Upper Triple Mount. See FIGURE 4.
50. If applicable, remove and retain the nut and ferrules from the brass union fitting (23) and attach it to the tube installed in the previous step. See FIGURE 4.

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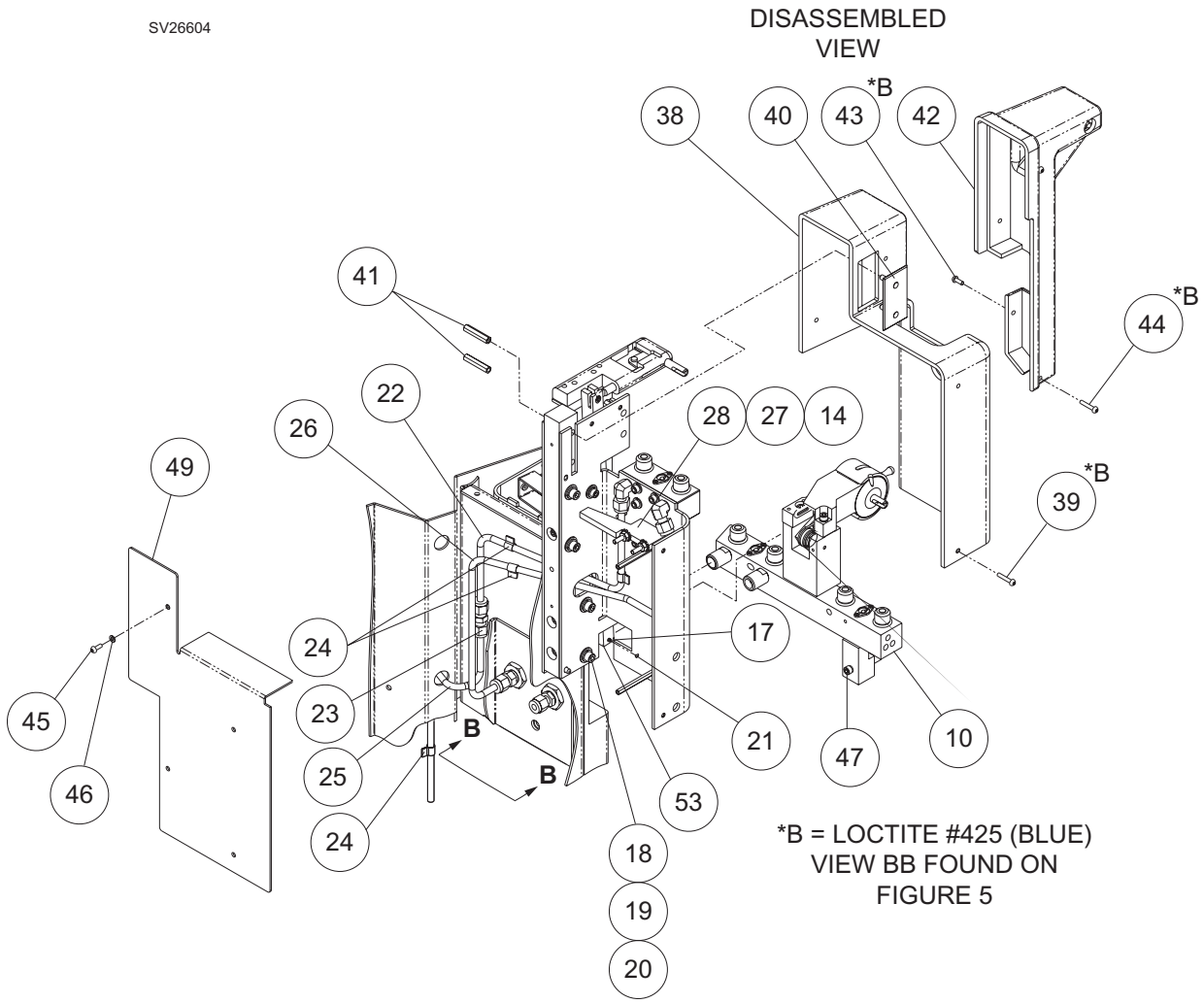

FIGURE 4. Triple Vapor Mount Assembly - Disassembled View

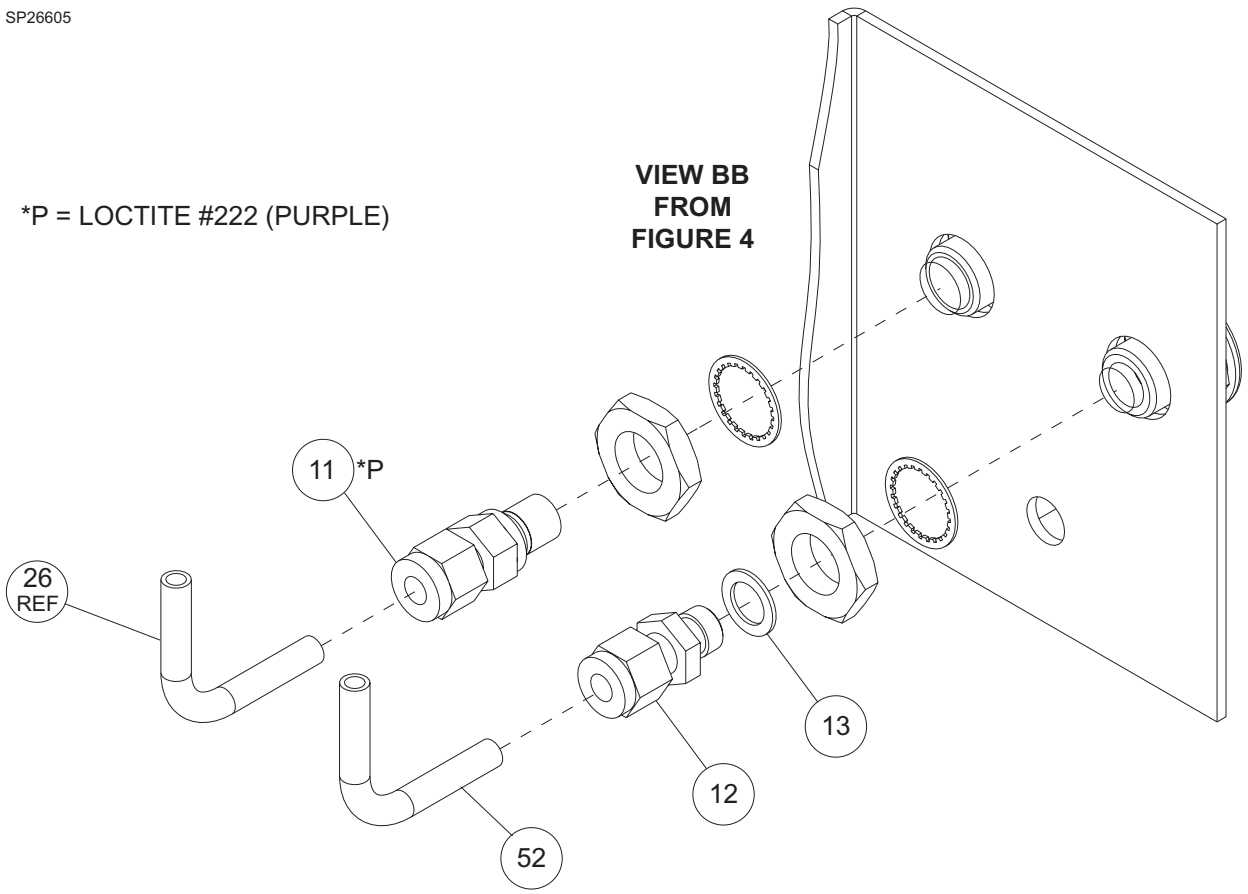

FIGURE 5. Triple Vapor Mount Assembly - View BB

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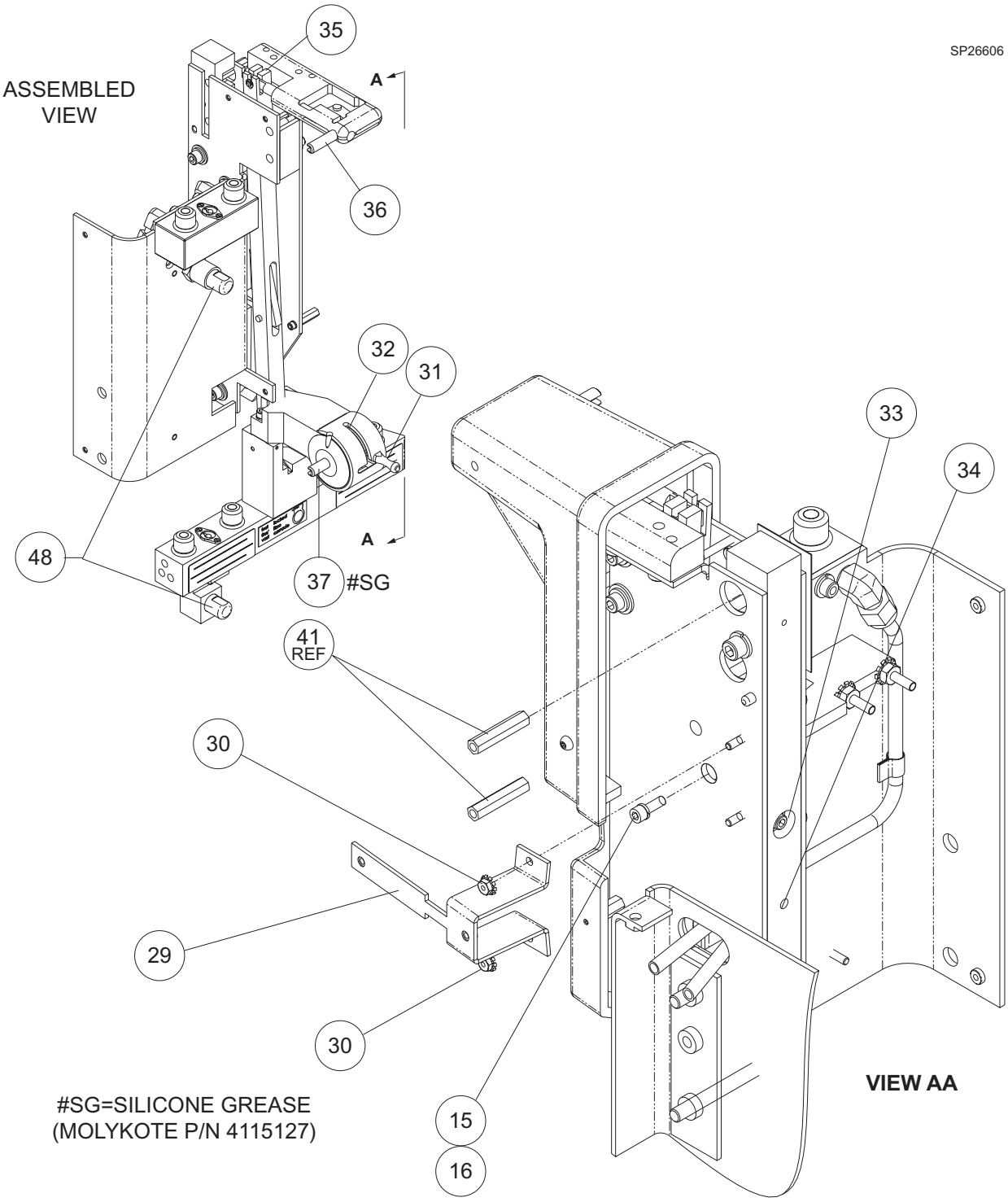

FIGURE 6. Triple Vapor Mount Assembly - Assembled View

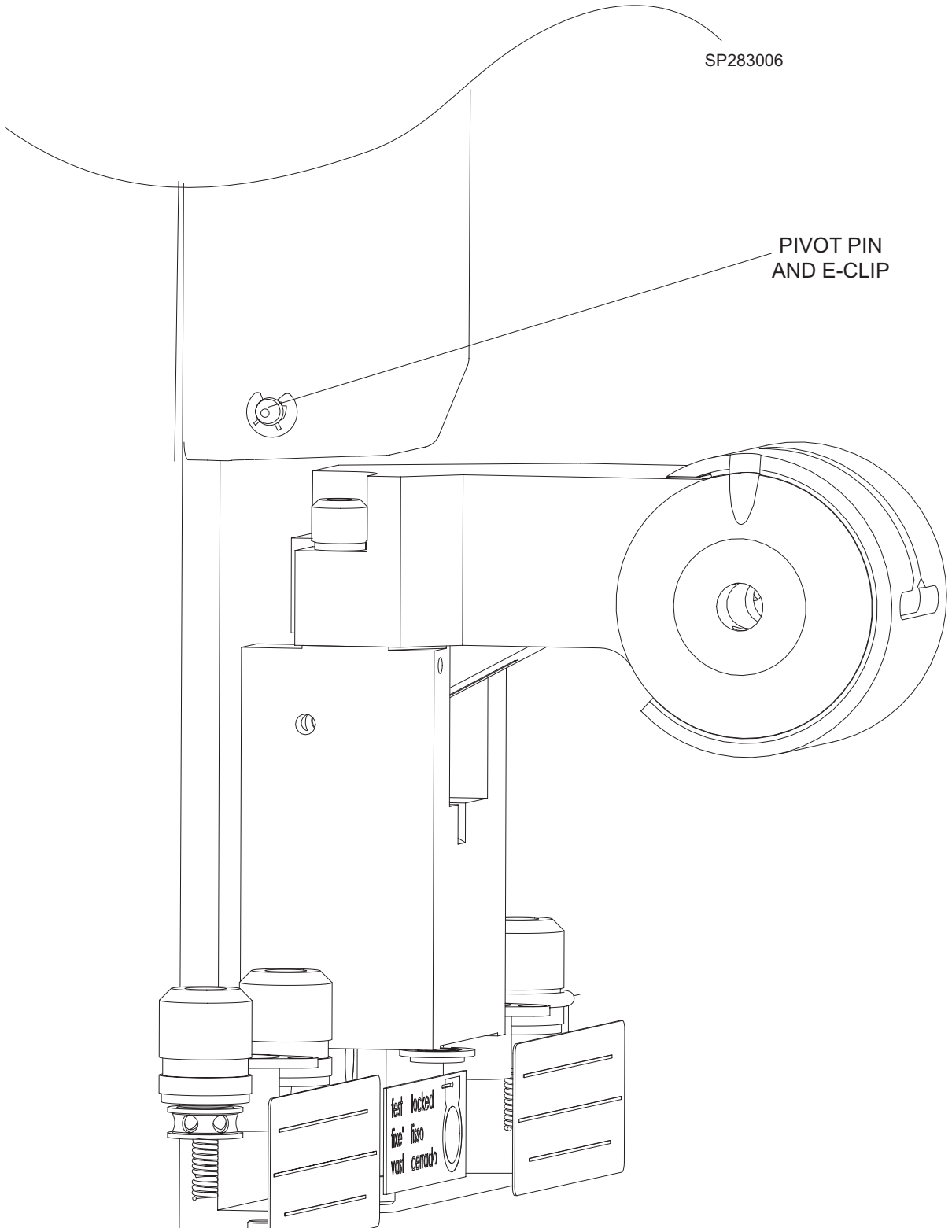

FIGURE 7. Pivot Pin Positioning

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51. Locate tube (25). If nut and ferrules were not previously installed, insert either end of the tube into ¼ tube fitting (23). While applying pressure on the ¼ tube fitting tighten with a wrench. Remove the fitting and inspect to ensure the tube is protruding at least 1/8" beyond the front ferrule. Repeat this process on the opposite end of the copper tube using a spare nut and ferrules. Slide the round end of the nut into the copper tube followed by the small ferrule oriented with its shoulder towards the tube, then the large ferrule oriented with its larger diameter towards the tube. While applying pressure on the ¼ tube fitting, thread the hex nut onto the ¼ tube fitting body and tighten with a wrench. Remove the fitting and inspect to ensure the tube is protruding at least 1/8" beyond the front ferrule. If not previously installed, apply a 'Mix' label (24) to each end of this tube. See FIGURE 4.
52. Starting from the cockpit weldment, insert the long end of copper tube (25) into the lower access hole in the flowmeter housing and rotate the tube to gain proper alignment for its insertion. Secure tube to the upper port of the existing union fitting (4). Connect the other end of this tube to the union fitting installed in the previous step. See FIGURE 2. and FIGURE 4.
53. Tighten all copper tube connections installed in the previous steps.
54. Locate tube (26). If nut and ferrules were not previously installed, slide the round end of the nut into the copper tube followed by the small ferrule oriented with its shoulder towards the tube then with the large ferrule oriented with its larger diameter towards the tube. Insert the tube onto ¼ tube fitting (23). While applying pressure on the ¼ tube fitting, tighten with a wrench. Remove the fitting and inspect to ensure the tube is protruding at least 1/8" beyond the front ferrule. Repeat this process on the opposite end of the copper tube. If not previously installed, apply a 'Mix' label (24) to each end of this tube. See FIGURE 4.
55. Starting from the cockpit weldment, insert the 90 degree end of copper tube (26) into the upper access hole in the flowmeter housing and rotate the tube to gain proper alignment for it insertion. Attach the copper tube's 90 degree end to the brass fitting at inboard port of the Lower Triple Mount assembly and the other end to the inboard port of the Upper Triple Mount assembly as shown in FIGURE 4.
56. Tighten the copper tube connections installed in the previous steps.
57. Install two 8-32 x 1-1/2" flat head screws (27), and 8-32 kep nuts (28), to secure the brace bracket (14) to the Upper Vapor Mount assembly, and retighten hardware (15,16). See FIGURE 4. and FIGURE 6.
58. Install the cover bracket (29) to the studs on the Upper Triple Vapor Mount assembly and secure it by using two 6-32 kep nuts, (30). See FIGURE 6.

Calibration - Theory of Operation

The exclusion mechanism of the Triple Vapor Mount provides the clinician with an easy to use, safe and reliable means to select any one of up to three vaporizers without requiring system reconfigurations. This mechanism is comprised of numerous mounts, pivots, bell cranks and linkages. Although the components in this assembly are manufactured and inspected to very strict tolerances, a stack-up of tolerance due to the large number of components has resulted in the need for a calibration adjustment to ensure the proper relationship between the selector knob and upper exclusion pin. Specifically:

When a vaporizer is mounted in the upper location and turned on, the upper exclusion pin extends far enough to the left to ensure that the selector knob can not be moved down into the lower slot.

The mechanism is not too tight, so as to prevent the selector knob from being moved to the end of the horizontal slot without binding.

When the selector is moved to the top of the vertical slot, the upper exclusion pin is retracted far enough to the right to permit a vaporizer to be installed, turned on, or removed from the upper location.

Calibration is accomplished by moving the location of a control arm, that provides the pivot point for the lever. The lever connects the upper mount and lower mount exclusion linkages, and moving its pivot point changes the relationship between the selector knob and upper exclusion pin.

A pivot pin near the top of the control arm is anchored to the sheet metal frame, providing for a fixed pivot point. The lever pivot point is located by a floating pivot pin near the bottom of the control arm.

The head of the upper calibration cap screw is captured by the clearance hole of the main block and threaded into a sleeve on the control arm. Turning the upper calibration screw clockwise will move the control arm and the pivot point of the lever toward the rear of the machine thus reducing the free-play in the mechanism. By tightening the upper calibration screw to eliminate all free play from the mechanism (including the top of the lever), when the selector knob is in the far right position, the upper exclusion pin is extended as far to the left as the mechanism will allow it to go. This is the intent of the procedure.

The lower calibration set screw is threaded through the main block and is adjusted until is makes contact with the control arm, providing a means to lock the control arm in place and to prevent unintended movement of the calibration screws.

59. Slide the exclusion knob (31) to the far right position and verify the knob is resting at far end of T-slot (32). If the knob can not travel the full required distance, loosen the upper and lower calibration screws (33, 34) by turning them several revolutions counterclockwise. See FIGURE 6.

    CAUTION: Do not back out the calibration screws more than is necessary to access the pivot pin or the calibration screws may fall out from their sockets.

60. Using your index finger, gently rock the top of the lever (35) back and forth while slowly rotating the upper calibration screw (33) clockwise and stop when you get to the point of eliminating the free play. If the upper calibration screw begins to feel tight before the lever free play is eliminated, further loosen the lower calibration screw (33) by turning it several revolutions counterclockwise and repeat this step.
61. Rotate the upper calibration screw (33) an additional 1/4 turn clockwise.
62. Rotate the lower calibration screw (34) clockwise until it is snug.
63. Finish tightening the upper calibration screw (33) by turning it clockwise, but do not apply excessive force.
64. Verify no free play at the top of the lever (35) with knob (31) at far, right end of the T-slot (32). If this calibration verification fails, the interlock mechanism calibration is too loose and the calibration must be repeated (refer to steps 59. through 63.). Before

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repeating the calibration, first loosen both calibration screws several revolutions and then, when performing step 61., rotate the upper calibration screw (33) an additional 3/8 of a turn clockwise instead of 1/4 turn clockwise.

65. Verify knob (31) can be moved freely from right to left and back again along the full length of the T-slot (32), paying particular attention to ensure proper knob travel without binding at the far right position. If this calibration verification fails, the interlock mechanism calibration is too tight and the calibration must be repeated (refer to steps 59. through 63.). Before repeating the calibration, first loosen both calibration screws several revolutions and then, when performing step 61., rotate the upper calibration screw (33) an additional 1/8 of a turn clockwise instead of 1/4 turn clockwise.
66. Verify that the upper calibration screw (33) is still tight when knob is moved into the vertical leg of the T-slot (32). If this verification fails, the lower calibration screw (34) has not bottomed out against its internal stop (snug fit likely due to tight fit between screw and tapped hole). Back off the upper calibration screw 1/8 turn, tighten lower calibration screw, and repeat steps 63. through 66. Refer to FIGURE 8.
67. Lubricate the upper and lower slider bars (36, 37) with light coating of Molykote (P/N 4115127).
68. Verify the interlock mechanism operation by cycling the knob (31) up and down a total of 25 times and then side to side a total of 25 times.
69. Using a lint free cloth, wipe of any excessive lubrication from the upper and lower slider bars (36, 37).
70. Install the middle cover (38) then secure it by first applying Loctite #425 (Blue) to the threads of the five 6-32 x ½ button head screws (39). See FIGURE 4.
71. Install the rectangular cover (40) to the middle cover and secure it with two 5/16” Standoffs (41) if applicable, or remount the optional Boom Arm Mount by reusing the hardware previously removed. See FIGURE 4.
72. Install front cover (42), then secure it by first applying Loctite #425 (Blue) to the threads of the 6-32 x 3/8 button head screw (43) and install it onto the standoff at lower inboard mount, then apply Loctite #425 (Blue) and install the remaining three 6-32 x ½ button head screws (44). See FIGURE 4.

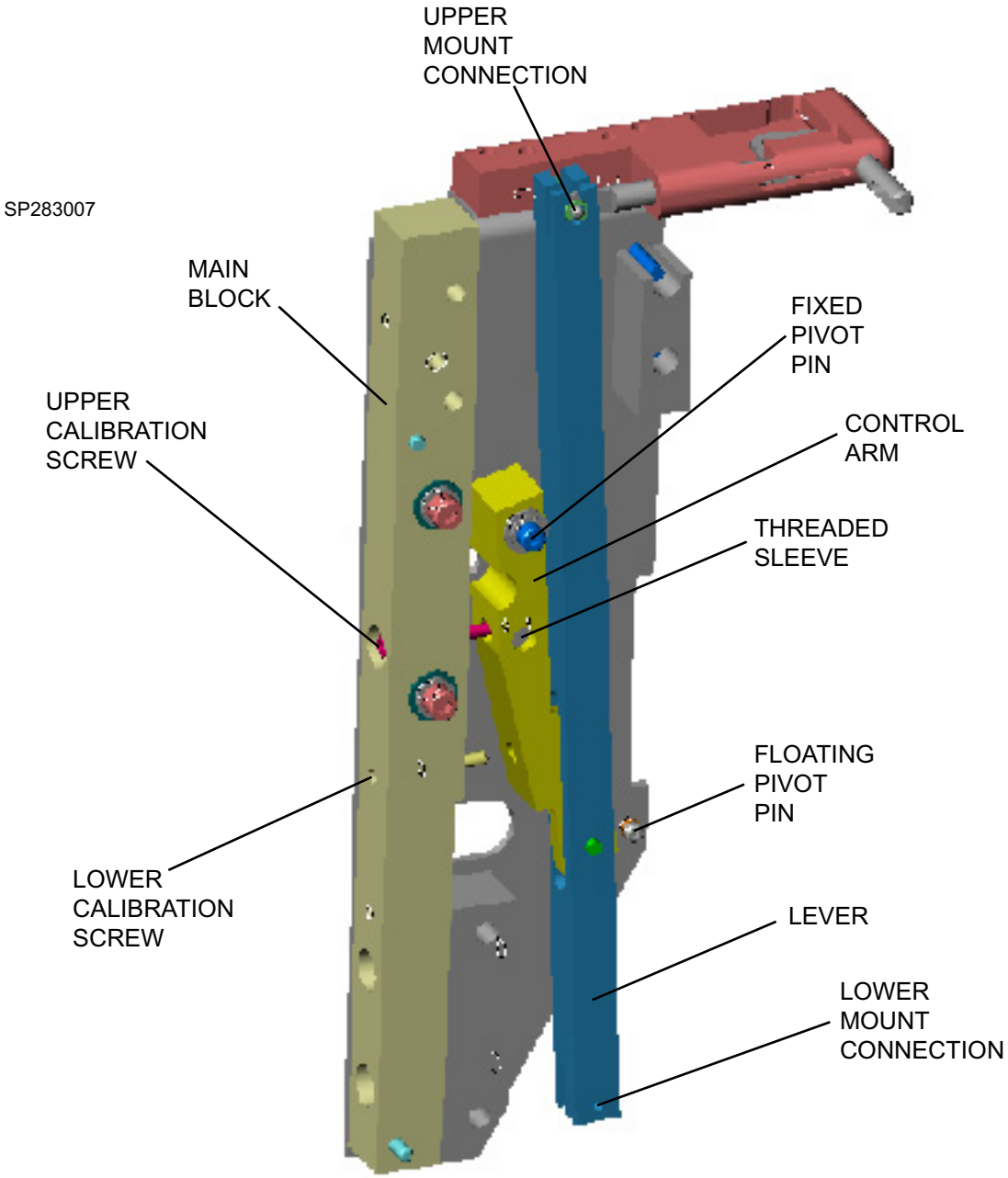

FIGURE 8. Calibration Screws (Internal Workings)

73. If the machine is fitted with a D-Tec vaporizer (Desflurane), temporarily install either a Vapor 19.n or Vapor 2000 onto the upper mount to perform the next test and lock it in place. Reinstall all other vaporizers to their intended locations and lock them in place.

WARNING: Do not install D-Tec vaporizers (Desflurane) in lower positions.

NOTE: If the machine is fitted with a Desflurane vaporizer, refer to SP00189. Refer to the Setup and Installation manual for all other model vaporizers.

74. Rotate the knob (31) to the up position. Rotate the upper vaporizer's dial 180 degrees and align the dial's corresponding socket to the upper slider bar (36) then apply moderate down force on the knob and verify that vaporizers in the left and right positions can not be turned on. Refer to FIGURE 6.
75. If applicable, reinstall the vaporizers to their intended locations and lock them in place.

    WARNING: Do not install D-Tec vaporizers (Desflurane) in lower positions.

76. With all vaporizers turned off move the knob (31) to a position that will orient the appropriate slider bar (36 or 37) to lock out the vaporizer being verified. If the slider bar travels into the Vapor 19.n or Vapor 2000 vaporizer socket with equal clearance at the top and bottom, height adjustment is not required, or if the corresponding pin of the D-Tec vaporizer (Desflurane) is in vertical alignment with the slider bar, height adjustment is not required. Repeat this verification on the remaining vaporizers.
77. If verification reveals that all vaporizers are at the proper height, skip this step. If the inboard mounted vaporizer height requires adjustment, refer to paragraph 5.16 in the Narkomed 6000 Series Service Manual. If a height adjustment of the outboard or upper vaporizers is required, loosen the corresponding jam screw (47). Rotate the back rest bushing (48) clockwise to lower the vaporizer or counterclockwise to raise the vaporizer to the proper height. Retighten the jam screw. Refer to FIGURE 4. and FIGURE 6.
78. Install the rear Triple Vapor cover (49) and secure it with four 6-32 x 3/8 button head screws and #6 lock washers (45, 46). See FIGURE 4.
79. Affix blank label contained in kit directly over existing label (50), located below the Lower Triple Mount assembly (10) on the cockpit. See FIGURE 9.

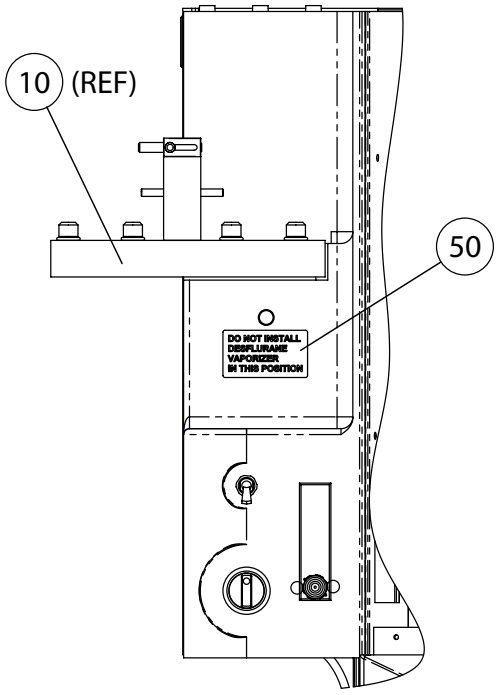

FIGURE 9. Cockpit Label Replacement

80. Slide the gas analyzer in the lower bay of the cockpit weldment and tighten its captive mounting screw.
81. Attach the Vitalbus cable to the cable connection at the back of the gas analyzer and secure it by tightening the two thumbscrews.
82. Attach the exhaust line to the hose barb at the back of the gas analyzer. Reconnect the patient sample line at the gas analyzer water trap.
83. Install the upper blind plate over the upper bay of the cockpit weldment, or if fitted with an Integrated Patient Monitoring Module, slide it into the upper bay of the cockpit weldment and tighten its captive mounting screw. Also, reconnect its Vitalbus cable and secure it by tightening the two thumbscrews, then reattach the patient data cables.
84. Reinstall the upper back panel.
85. Restore AC power to the machine and enable the circuit breakers.
86. If the cockpit weldment was not replaced, skip to next the step. Or cycle system power and verify that the System Power switch operates properly and perform the Suction Switch and Auxiliary Oxygen Flowmeter tests. Refer to paragraph 6.10 and 6.13.5 of the Narkomed 6000 Series Technical Service manual.
87. Perform a Fresh Gas Leak / Exclusion test. Refer to paragraph 6.8 of the Narkomed 6000 Series Technical Service manual. Repeat the exclusion system checks with the activated vaporizer dial set to 1/3, and 2/3 then turn it off. If fitted with a Desflurane Vaporizer repeat the leak test with the vaporizer in the secondary dial release position > 12%, then turn it off.
88. Perform the GAP or GAP2 accuracy tests. Refer to paragraph 6.20.2 or 6.21.2 of the Narkomed 6000 Series Technical Service manual.
89. If fitted with an IPMM, verify it completes its power up self diagnostic tests.
90. If the conversion procedure was performed on a Narkomed 6000 machine, locate the Operator's Instruction 3-ring binder assembly. Locate the following supplement contained in the conversion kit: Triple Vapor Mount Conversion Supplement to Narkomed 6000 Operator's Manual, Supplement number 4118495. Insert the supplement after the supplements tab in the binder assembly. If performing a Triple Vapor Mount Conversion onto a Narkomed 6400 machine, discard this supplement.

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